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Oral sex practices, oral human papillomavirus and correlations between oral and cervical human papillomavirus prevalence among female sex workers in Lima, Peru

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Summary

Few data exist on oral human papillomavirus (HPV) prevalence in female sex workers (FSWs). Information regarding oral sex practices of 185 Peruvian FSWs, 18–26 years of age, was obtained via survey and compared with HPV testing results of oral rinse samples. Oral HPV prevalence was 14/185 (7.6%); four (28.9%) HPV genotypes were carcinogenic. One hundred and eighty-two participants reported having had oral sex; 95% reported condom use during oral sex with clients and 9.5% with partners. Women who had oral sex more than three times with their partners in the past month were more likely to have oral HPV than women who had oral sex three times or less ($P = 0.06$). Ten (71.4%) women with oral HPV were HPV-positive at the cervix; conversely 8.3% of women with cervical HPV were HPV-positive in the oral cavity. The prevalence of oral HPV was relatively low, considering the high rates of oral sex practiced by these women.

Keywords

human papillomavirus; HPV; oral; female sex workers; cervical abnormality; oral rinse samples; concordance; Peru

INTRODUCTION

Human papillomavirus (HPV) has been shown to cause oropharyngeal cancer.¹ A review of over 5000 head and neck cancer samples revealed the presence of HPV in 35.6% of oropharyngeal cancers.^{2–4} A recent study of 26,474 head and neck cancer specimens in

Denmark also showed HPV 16 to be the most common genotype in head and neck cancers.⁵ Other causes of oral cancer include smoking, chewing tobacco and alcohol.^{4,6,7} There were 228 incident oral cancers reported in Peruvian women in 2008, with age-standardized incidence and mortality rates of 1.7 and 0.6 per 100,000 persons per year, respectively.⁸ The relationship between oral and cervical HPV has been examined but the data are limited.^{9,10} Recent studies of immunocompetent women in Italy and female sex workers (FSWs) in Japan revealed that site-specific infections are not correlated.^{11,12}

FSWs may be at higher risk of cervical and oral HPV infections due to their exposure to multiple sexual partners.^{3,13,14} Reported overall cervical HPV prevalence among FSWs has ranged from 2.3% to 100%,^{15–19} with few studies reporting oral HPV prevalence.^{12,20}

We determined the prevalence of HPV genotypes in the oral cavity and cervix in Peruvian FSWs and examined the association of oral HPV with oral sex practices.

METHODS

Two hundred FSWs in Lima, Peru were recruited from 49 different locations and enrolled in a study of cervical HPV prevalence and HPV vaccine acceptability, in which women were offered quadrivalent HPV vaccine (HPV4, Gardasil, Merck and Co Inc, Whitehouse Station, NJ, USA) according to the standard (0, 2, 6 months) or a modified (0, 3, 6 months) schedule. The locations where women were recruited varied in their costs for services, duration of services and number of FSW employees. Eligibility criteria included age 18–26 years, healthy, HIV seronegative, not pregnant and not having received HPV vaccine. At their baseline visit, participants had a Pap smear and cervical samples were collected for HPV testing using the Digene sampling kit with standard transport medium (STM) (Qiagen, Digene Inc, Gaithersburg, MD, USA). A survey was administered in Spanish with questions about sexual health, condom use, partnerships and demographics.

All participants were asked to participate in an optional study procedure to obtain oral HPV prevalence from 30 March 2010 to 26 July 2010. If they agreed, participants answered nine additional questions regarding risk behaviours including condom use with clients and partners for oral sex and they provided an oral rinse sample by swishing and gargling two tablespoons of Scope (Proctor and Gamble, Cincinnati, OH, USA) mouthwash.

This study was approved by Institutional Review Boards at the Johns Hopkins Bloomberg School of Public Health, Universidad Peruana Cayetano Heredia, NGO Via Libre and the Instituto Nacional de Salud. All participants provided written informed consent for their participation in this study.

Analyses

Oral rinse and cervical samples were stored at –20°C and sent to Johns Hopkins Bloomberg School of Public Health for testing. Aliquots of Scope mouthwash and water without sampling were sent and tested as negative controls. DNA was extracted using the QIAamp DNA Blood Kit (Qiagen). HPV DNA was determined by polymerase chain reaction (PCR) using PGMY09/PGMY11 primers.²¹ Roche (Roche Diagnostics, Indianapolis, IN, USA)

linear array genotyping test was done to obtain an estimate of current HPV DNA prevalence of carcinogenic and lower-risk HPV types including 6, 11, 16, 18, 26, 31, 33, 35, 39, 40, 42, 45, 51, 52, 53, 54, 55, 56, 58, 59, 61, 64, 66, 67, 68, 69, 70, 71, 72, 73, 81, 82, 82var, 83, 84 and 89.²² SiHa and K562 cells spiked into each collection medium (STM and Scope) were used as positive and negative extraction controls, respectively, in each extraction batch. In addition, a 25- and 500-copy HPV 16 and 18 plasmid amplification control was included in each PCR plate.

Survey data were double entered and checked for logic and range. Discrepancies were resolved using the source document. Pearson's chi-square tests and Fisher's exact test were used to evaluate differences in oral HPV prevalence. Differences in means were computed by *F*-test. The prevalence of oral and cervical HPV was compared using McNemar's test for paired data. Frequencies of oral and vaginal sex were compared and presented by site-specific HPV status. Stata 9.0 (Stata Corp, College Station, TX, USA) was used for all quantitative data analysis.

RESULTS

Demographics and sexual behaviours

One hundred and eighty-five women participated in the optional oral rinse procedure. The mean age was 22.9 years and mean time since sexual debut was seven years (Table 1). Of the 134 women who reported having non-paying sex partners, 74 (55%) considered themselves to be single. Ninety-eight percent of women currently read a newspaper or magazine and 70.3% had heard of HPV. Of the 49 women who reported having a genitourinary tract infection in the past year, 48% reported cervicitis, 23% bacterial vaginosis, 15% HPV and 6% genital herpes.

More than 98% ($n = 182$) reported having performed oral sex in their lifetime and 20% (36) reported using condoms for oral sex all of the time. The median number of oral sex acts with clients within the past month was 30, and 95.4% of women reported condom use during oral sex. The median number of vaginal sex acts with clients within the past month was 100; 99.1% were with condoms. The median number of oral sex acts with non-paying partners in the past 30 days was 3; 9.5% of these were with condoms. The median number of vaginal sex acts with non-paying partners in the past month was 5; 31% with condoms.

Oral HPV results

Oral HPV was detected in 14 out of 184 women (7.6%), all of whom reported practising oral sex (Table 2). The most common HPV types were 59 (1.1%), 55 (1.6%) and 72 (1.6%). Four (2.2%) women had prevalent oral carcinogenic HPV types, one of whom had HPV 16. Other HPV genotypes detected included HPV 35, 62, 68, 71, 84 and 89.

Prevalent oral HPV infection was not associated with age ($P = 0.19$), age at first period ($P = 0.28$) or age at first sex ($P = 0.48$). Women with oral HPV were no more likely to have reported a sexually transmitted infection (STI) in the past year ($P = 0.51$) or to use oral contraceptives ($P = 0.18$) than women without oral HPV, but orally infected women were somewhat more likely to have an abnormal Pap result ($P = 0.09$). Women who had oral sex

more than three times with their nonpaying partners in the past month were more likely to have oral HPV than women who had oral sex three or fewer times ($P = 0.06$).

Oral and cervical HPV comparison

Cervical HPV prevalence was approximately 10 times the prevalence of oral HPV (65.8% versus 7.6%, $P < 0.01$). Only one participant had prevalent HPV 16 in the oral cavity, compared with 27 participants with HPV 16 detected in the cervix. More than 70% of women with any HPV in the oral cavity had concurrent cervical HPV infection, while only 6.4% of women without cervical HPV were oral HPV-positive. Of the four women with carcinogenic HPV in the oral cavity, three (75%) had carcinogenic cervical HPV, and of the 10 women with low-risk HPV in the oral cavity, three (30.0%) had low-risk cervical HPV.

There were no significant differences in the frequencies of oral and vaginal sex in the past month, and oral ($P > 0.2$) or cervical HPV detection ($P > 0.2$) (Table 3). The mean monthly frequency of vaginal sex with clients (154.1) and non-paying partners (9.3) was higher than the mean number of oral sex with clients (84.5) and non-paying partners (7.5) ($P < 0.01$). Condom use with non-paying partners was significantly lower than with clients for both oral ($P < 0.01$) and vaginal sex ($P < 0.01$). The mean frequency of oral sex with clients and partners was higher among women who were oral HPV-positive compared with women HPV-positive in the cervix, but not significantly ($P = 0.78$ and $P = 0.18$, respectively).

DISCUSSION

HPV infection in the oral cavity was not correlated with HPV infection in the cervix in this FSW population. Oral HPV prevalence was not significantly associated with years since first sex, and oral HPV prevalence was much lower than cervical HPV prevalence. The rate of reported oral sex with clients was 10-fold the rate with non-paying partners.

Reported oral sex with non-paying partners more than three times in the past month was borderline – significantly associated with oral HPV prevalence. We have not identified other studies which reported the relationship of oral sex practices with oral HPV or oral cancers in FSWs. In the general population, pooled analysis of over 10,000 individuals revealed that ever having oral sex and having more partners were associated with oral cancer.²³ Additional studies suggest an association between oral sex frequency²⁴ and more lifetime partners²⁵ with oral HPV DNA prevalence.

A study of 225 FSWs in Singapore reported 56.9% condom use for oral sex with clients and 97% condom use for vaginal sex.²⁶ Our results show similar condom use for vaginal sex but higher condom use for oral sex. Consistent condom use for vaginal sex with clients has been reported less than 50% of the time in other studies of FSWs; few studies have reported condom use for oral sex.^{17,27} The high reported condom use for oral sex in this study may be a result of response bias due to the mandatory condom use policy in most locations of sex work, in which condoms were sold at the door as part of the entrance fee. Women who selected to participate in our study may have also been more aware of the consequences of unsafe sex and used condoms more frequently with their clients.

The lower HPV prevalence in the oral cavity compared with the cervix detected in this study is consistent with a study of FSWs in Spain where the cervical HPV prevalence was 27.9% and oral prevalence was 7.9%.²⁰ There was no apparent concordance of oral and cervical HPV among 188 FSWs in the Spanish study, which is consistent with our results.²⁰ In the Spanish study, the highest oral HPV prevalence was among women aged older than 41 years, in contrast to cervical HPV results in FSWs, which showed a decreasing trend with age.^{20,28,29} Because of the narrow age range in our study, we were unable to assess the association of oral HPV with age. In addition, due to the low prevalence of oral HPV in this relatively small sample, we had limited power to detect differences between other behavioural and demographic variables and oral HPV.

Drinking and smoking are known risk factors for oral cancers.⁶ We did not collect smoking or drinking data among our study participants. A previous study of 319 FSWs in Lima showed that 45.5% were current smokers and 46.4% drank alcohol before work.³⁰

The prevalence of oral HPV is consistently lower than cervical HPV, even in immunosuppressed populations.^{9–12,20} There was a modestly lower frequency of oral compared with vaginal sex in this FSW population, but the high absolute frequency of oral sex suggests that factors other than rates of exposure contribute to the 10-fold lower rates of oral HPV prevalence.

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Competing interests: Neal Halsey received financial compensation for serving on Safety Monitoring Boards for the postlicensure safety assessment evaluation of Gardasil and other vaccines within the past two years. He received no financial support for participation in this study.

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Table 1

Demographics and oral sex practices of 184 female sex workers in Lima, Peru, and their HPV DNA results in the oral cavity

	All participants (n = 184)	Oral HPV DNA negative (n = 170)	Oral HPV DNA positive (n = 14)	P value *
Mean age in years (95% CI)	22.9 (22.6–23.2)	22.9 (22.6–23.2)	23.1 (22.0–24.1)	0.19 [†]
Mean age at menarche (95% CI)	13.0 (12.8–13.2)	12.9 (12.7–13.2)	13.4 (12.4–14.3)	0.28 [†]
Mean number of years since sexual debut (95% CI)	7.0 (6.6–7.4)	7.0 (6.6–7.4)	6.9 (5.5–8.3)	0.53 [†]
Marital status (%)				
Single	115 (62.2)	108 (63.2)	7 (50.0)	0.35
Married	9 (4.9)	9 (5.3)	0 (0.0)	
Co-habiting	53 (28.7)	46 (26.9)	7 (50.0)	
Separated/divorced	8 (4.3)	8 (4.7)	0 (0.0)	
Has non-paying sexual partners (%)				
Yes	134 (72.4)	122 (71.4)	12 (85.7)	0.36
No	51 (27.6)	49 (28.7)	2 (14.3)	
STI diagnosis in past year[‡] (%)				
Present	49 (26.5)	44 (25.7)	5 (35.7)	0.42
Absent	136 (73.5)	127 (74.3)	9 (64.3)	
Have had oral sex in lifetime (%)	182 (98.4)	168 (98.3)	14 (100.0)	1.00
Use of condoms for oral sex (%)				
Never	3 (1.67)	3 (1.8)	0 (0.0)	0.89
Less than half of the time	5 (2.8)	5 (3.0)	0 (0.0)	
Half of the time	3 (1.7)	3 (1.8)	0 (0.0)	
More than half of the time	135 (74.2)	123 (73.2)	12 (85.7)	
All of the time	36 (19.8)	34 (20.2)	2 (14.3)	
Clients expect oral sex (%)				
Never	3 (1.7)	3 (1.8)	0 (0.0)	0.16
Sometimes	45 (24.7)	42 (25.0)	3 (21.4)	
Half of the time	20 (11.0)	19 (11.3)	1 (7.1)	
More than half of the time	91 (50.0)	86 (51.2)	5 (35.7)	
All of the time	23 (12.6)	18 (10.7)	5 (35.7)	
Mean proportion of protected oral sex with condoms in last month with clients (95% CI)	95.4 (92.4–98.4)	95.0 (91.8–98.3)	99.82 (99.4–100.0)	0.11 [†]
Had oral sex with last client (%)	135 (74.2)	125 (74.4)	10 (71.4)	0.81
Used condom for oral sex with last client (%)	128 (94.8)	119 (95.2)	9 (90.0)	0.48
Frequency of oral sex with partners in past month (%)				
Less than 3 times	68 (48.2)	65 (50.8)	3 (23.1)	0.06
3 or more times	73 (51.8)	63 (49.2)	10 (76.9)	
Mean proportion of protected oral sex with condoms in last month with partners (95% CI)	9.5 (4.1–15.0)	8.1 (2.7–13.5)	20.0 (24.8–44.8)	0.12 [†]

STI = sexually transmitted infection; HPV = human papillomavirus; CI = confidence interval

* Fisher's exact test was used or χ^2 *P* value unless otherwise noted

[†] Significance calculated with analysis of variance testing

[‡] STI diagnoses were limited to viral or bacterial

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Table 2

Comparison of oral and cervical HPV DNA prevalence among 184 female sex workers

	Oral HPV-positive <i>n</i> (%)	Oral HPV-negative <i>n</i> (%)
Cervical HPV-positive	10 (71.4)	111 (65.3)
Cervical HPV-negative	4 (28.6)	59 (34.71)

HPV = human papillomavirus

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Table 3

Frequency of oral and vaginal sex in the past 30 days, and proportionate condom use of 125 HPV-positive FSWs in Lima, Peru

Sexual practice	Oral cavity positive (n = 14) Mean (median)	Cervix positive (n = 121) Mean (median)
Oral sex with clients		
Frequency	83.7 (20.5)	75.5 (30.0)
Condom use (%)	99.8 (100.0)	95.4 (100.0)
Oral sex with partners		
Frequency	6 (5.0)	5.5 (2.0)
Condom use (%)	20.0 (0.0)	9.9 (0.0)
Vaginal sex with clients		
Frequency	226.6 (232.0)	147.6 (100.0)
Condom use (%)	100 (100.0)	98.9 (100.0)
Vaginal sex with partners		
Frequency	9.3 (10.0)	7.9 (4.0)
Condom use (%)	29.6 (0.0)	30.1 (0.0)

HPV = human papillomavirus; FSW = female sex worker